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Challenges in assessing combined exposure to chemicals in Finland

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Combined exposure to chemicals: why and how?

- Consumers exposed to numerous chemicals through food (and other pathways)
- Risk assessments focus on one chemical at a time
  - Practical for control, but
  - May underestimate total risk from chemicals with same effect and MoA

- Relative potency factors based on dose-response data for the same effect

$$Exp_{mix} = RPF_1 \times Exp_1 + RPF_2 \times Exp_2 + RPF_3 \times Exp_3 + \cdots$$

Current status of cumulative exposure assessment

- Focus has mainly been on pesticides, but other foodborne compounds also may be of interest in food safety.
- Tools to assess cumulative exposure have been developed
  - MCRA tool (further developed in EuroMix project) so far the only published European tool
  - Other tools can also be utilised, if combined exposure function is included in the model.

What data are needed for assessment?

1. Consumption data (relevant foods, population subgroups)
   - ✓ Often easiest to obtain, although surveys expensive, % of participation
2. Occurrence data for all studied chemicals in these foods
   - ✓ Comprehensive, good quality data
   - ✓ Monitoring data may not be enough; for best results, all compounds studied from same samples
3. Toxicological data for all studied chemicals
   - ✓ Dose-response data for all possible end points, info on mode of action for tox effect. Same species, same response.
   - ✓ Difficult to obtain for many chemicals

Finnish pilot: cumulative heavy metal exposure

- Finnish children (1Y – 6Y)
- Cd, Pb, inorg As, inorg Hg or methyl Hg
- Effects studied:
  nephrotoxicity and neurotoxicity
- Assumption of additive effect.
- Comparability of available tox data?
  RPFs for neurotoxicity ← effects on human intelligence (MeHg, Pb), neuropathy in human (iAs) or mouse neurological damage / 100 (Cd).
- Literature suggests Cd and As also affect human intelligence, but no dose info → assumption that the dose is ≤ found values

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Dietary exposure of Finnish children to heavy metal mixture – a cumulative assessment

Johanna Suomi, Pirkko Tuominen & Kirsti Savela

https://doi.org/10.1080/10807039.2017.1314760

Finnish pilot: cumulative heavy metal exposure

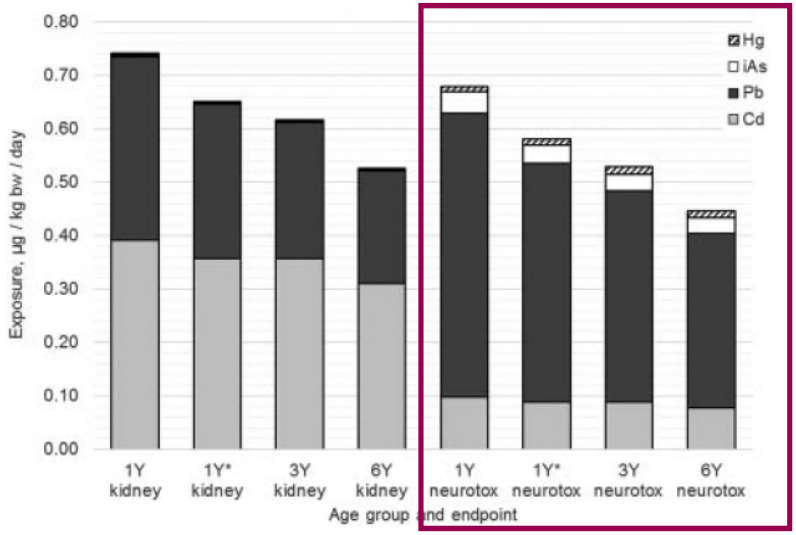

Figure 1. Levels of heavy metal exposure at age group mean level. Age group "1Y*" consists of 1-year-olds who were still breastfed at the time of consumption data collection. Nephrotoxic endpoint results are marked by "kidney" and neurotoxic endpoint results by "neurotox." Cd cadmium; Pb lead; iAs inorganic arsenic; for nephrotoxic endpoint Hg is inorganic mercury and for neurotoxic endpoint methyl mercury.

Neurotoxic effects in these age groups mainly through lead exposure
… the children consumed little fish / seafood.

https://doi.org/10.1080/10807039.2017.1314760

How could EFSA improve assessment of combined exposure to multiple chemicals?

- In the long run we should study:
  combined exposure to food improvement agents, mycotoxins, other contaminants, any mixture of these groups…
  - MSs only, or also assisted / funded by EFSA?

- Establishing, supporting an open database for toxicological data!
- Open access to (some of the) data in EFSA Data Warehouse?

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Thank you for your attention

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